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Ethno-geoarchaeological study of seasonal occupation: Bhiliscleitir, the Isle of Lewis

Patrycja Kupiec and Karen Milek

Introduction

Despite being amongst some of the most visible field remains seen within any upland location in Scotland, shielings as a subject of archaeological investigation have received relatively scant attention, and the focus of research has been mainly on their broader role as a part of economic or folk studies in the post-Medieval Period (Raven 2012). Limited work was undertaken in the late 1950s and 60s (Gaffney, 1959; Gaffney, 1967; MacSween, 1959; MacSween and Gailey, 1961), and this interest was kept alive by ethnographic work by Fenton (1977; 1980), and the historical study of shielings in Perthshire by Bil (1989; 1990a; 1990b).

Recent archaeological surveys by Raven (2012) on South Uist and by Branigan (2002) and Branigan and Foster (2002) on Barra and Bishop's Isles recorded numerous putative shieling sites with different shapes, sizes, and numbers of the structures visible on the ground, and different materials utilized to construct them, which all hint at different functions and chronologies of the sites. The earliest phase of one of the sites targeted for test-pit excavation on Barra was dated to the Viking Age on the basis of the artefactual assemblage, which was comparable to that of the Viking-age farm of Kilpheder on South Uist (Branigan and Foster 2002). The site was interpreted as a shieling due its marginal location, small size, and a shieling place-name, Gunnary, the shieling (Gaelic *airigh*) of Gunnar (Norse male name). However, since this is the only putative early medieval shieling site identified in the whole of the Outer Hebrides to date, we lack the wider picture of the importance of the shieling economy, the lengths and nature of occupation, or the developments, changes, and transitions the tradition underwent through time.

The decline of the shieling system in the Outer Hebrides coincided with a period of reorganisation of the highland and island farming society, which involved the clearance of townships to form consolidated sheep farms, and the subsequent emigration of large numbers of crofters. As a result of these socio-agrarian changes the practice of summer transhumance was largely abandoned in the Western Isles by the nineteenth century, with the exception of the Isle of Lewis, where it survived until the early 1950s. The long survival of the shieling

tradition on the Isle of Lewis, with ethnographic sources detailing the use of local shieling sites, provides an excellent opportunity for archaeological investigation of historically known shielings to broaden the repertoire of possible interpretations of the archaeological record, and improve the identification and interpretation of past shieling sites.

The criteria used to identify shielings in Scotland and the North Atlantic region vary significantly, and are often quite arbitrary, and based only on their presumed marginal location, place-names of unknown date and provenance, and atypical structural remains or artefactual assemblages (Love, 1981; Macsween and Gailey, 1961; Mahler, 2007; Matras *et al.*, 2004). The unchanging function of putative shieling sites is also often assumed, with no consideration made for possible shifts in the type and duration of occupation in response to changing economic, social, and cultural conditions, both on local and regional scales. This paper argues for the need for a more rigorous approach to shieling identification, using high-resolution geoarchaeological methods, which have the potential to identify punctuated occupation at archaeological sites (Kupiec *et al.*, 2016). To establish an analytical and interpretive framework that would be suited to investigate occupation surfaces at seasonally occupied sites, this paper presents the results of an ethnoarchaeological study of floor deposits at the nineteenth- to mid-twentieth-century shieling site at Bhiliscleiter on the Isle of Lewis, and compares them to floor formation processes, site maintenance practices, and activity areas described by an informant who stayed at the site.

The site of Bhiliscleiter

The Bhiliscleiter shieling settlement is situated 4 km from the road end at Skigersta on the east coast of Ness, Isle of Lewis, in north-west Scotland (Figure 1). The site consists of a group of eight shieling structures, which are arranged in close proximity and in a circular pattern (Figure 2). In total, 14 ruins of structures/rooms are still visible on the ground. The presence of a slight mound underlying the ruins suggests that the site went through multiple phases of use, which resulted in a build-up of occupation deposits, and/or earlier ruins.

Figure 1. Map of the Isle of Lewis showing the location of the Bhiliscleiter shieling settlement and Port of Ness

The site functioned as a shieling settlement until the 1950s, and at least since the mid-1800s, as it is marked on the first edition OS map (1853), but little is known about its chronology beyond that. The collapse deposit overlying the final occupation deposit in Structure 10

captured two bottle stoppers with a stamp and logo of W.M. Younger's Brewery in Edinburgh, and a bottle stopper of the same type was excavated from the collapse deposit in Structure 11. These bottle stoppers can be dated to pre-1960, when W.M. Younger's Brewery merged with Newcastle's Tyne Brewery to form Scottish & Newcastle Ltd. According to Anne Macleod of *Comunn Eachdraidh Nis* (Ness Historical Society), even after the site ceased to be used as a shieling settlement it remained a popular summer camping destination, especially for local teenagers (Anne Macleod pers. comm.). The site was visited by the photographer Dan Morrison in 1936, and his two published photographs depict the inside of one of the shielings (Figure 2), and two women standing in the front of a shieling hut (Figure 3). The first photograph captures the internal features and furnishings of the shieling in the final years of its use: a side bench, a wardrobe placed on what appears to be a bed of moss, a small table with milking utensils placed underneath and next to it, a central fire with a kettle over it, plates and mugs, a bed platform in the background, and walls covered with wallpaper. The latter photograph shows the stone foundation of the walls, and the roof construction, with the multiple strips of turf piled one on top of the other.

Figure 2. A student visit, Filiscleitor (Dan Morrison, 1936)

Figure 3. Ness women prepare to leave (Dan Morrison, 1936)

In 2012, Catriona Macdonald interviewed Mary Campbell, who spent three summers at Bhiliscleitor as a young girl. Her recollections record the internal organization of the shieling in detail:

It was the old traditional house on a smaller scale. And when you came in on the door and you brought the cattle in at night [...] they would go down to the right, one in his own, and the other in his own, and you went up to the living quarters to the left, in our house. [...] The bed [...] was made out of blocks of turf with a stone front. [...] And then the mattress...the heather...and you could change the heather as often...if the heather got flat and uncomfortable you could put fresh heather in [...]. And there was also lawn turf on benches, the grass side up [...] like cushions. There was a cupboard for the basins, for the milk storage, the milk that turned sour to make the cream and the cheese and things. There was a cupboard for the milk at the end of the bench, [...] and there were shelves on top with the crockery.

In 2007 Chris Barrowman surveyed the site for the Ness Archaeological Landscape Survey. The survey recorded the dimensions, internal organization, and the state of preservation of the shieling ruins. A topographic survey was also undertaken, and its results clearly show the extent of the mound on which the site is located (Figure 4, from Barrowman *et al.*, 2007:60).

Figure 4. Topographic survey of shielings at Bhiliscleitor (after Barrowman, 2007: 60)

Methodology

The archaeological work at the site presented here was undertaken in 2013. Two c. 0.7 x 1.5 m assessment trenches (TP1 and TP2) were opened in Structure 10, and one smaller, c. 0.7 x 1.2 m assessment trench (TP3) was opened in Structure 11 (Figure 5). Based on the visible internal features in Structure 10 (a possible side bench and bed platform), and in Structure 11 (possible side troughs), the functions of these structures were tentatively interpreted as a dwelling and a byre respectively. After the removal of the overlying turf and stone collapse layers, the test trenches were excavated to the bottom of the uppermost occupation deposits to expose the floor layers resulting from the last phase(s) of the structures' use. Due to time constraints, TP2 was only excavated down to the layer of stone collapse, which exposed and permitted recording of a side bench.

Figure 5. Plan of Structures 10-12 at Bhiliscleiter, showing the location of Test Pits 1-3. Internal features are highlighted in grey

The uppermost deposits in TP1 contained debris from the collapse of the structural elements, including window pane glass and pieces of corrugated iron. The deposits directly underlying the turf and root mat in both structures were also rich in finds, mainly glass bottles and fragments of other vessels. These probably represent the post-abandonment use of the shieling huts as temporary shelters.

Two floor deposits were exposed in TP1, both of which were compact and contained small quantities of charcoal flecks. However, the lowermost deposit was sandier, suggesting that it may represent a short abandonment phase when windblown sand could accumulate in the structure. Both deposits formed above a cobbled surface constructed with small rounded pebbles. In Structure 11, a very humic layer was deposited on the cobbled surface. The texture and the composition of this deposit suggested a very high organic content, which was interpreted in the field as a possible dung layer, in line with the preliminary interpretation of the structure's main function as that of an animal shelter. The cobbled surface exposed in this building was different from that excavated in TP1. It appears that in Structure 11 less care was taken to select cobbles of uniform size, roundness, and smoothness, and the cobbles were not arranged in any particular pattern. It is possible that the cobbled surface in Structure 10 had more of an aesthetic function, creating a nice, even floor surface, and in Structure 11 it was inserted to aid drainage and improve the maintenance, and perhaps even a seasonal removal, of very organic floor deposits. The cobbled surface in Structure 11 was thick, and consisted of

at least two distinct cobbling phases, with the older phase resting on a sterile yellow sandy loam, which can be interpreted as the natural soil underlying the site.

Excellent preservation of the ruins, and the well-documented last phase of their use, makes the Bhiliscleiter shielings settlement an excellent case study to explore the nature of summer transhumance on the Isle of Lewis, and to test the potential of microscopic investigation to detect seasonal occupation. Undisturbed block samples for micromorphological analysis were taken through the stratified sequence of occupation deposits by pressing aluminum sampling tins into the sections cutting through the uppermost occupation deposits in TP1 and TP3. One sample was taken from the NE section of the assessment trench in Structure 10 (sample 6), and one sample from the N section of the assessment trench in Structure 11 (sample 4). Two more samples were taken from the top of the floor layer, context 004, exposed in Structure 10 (samples 1-3). Sample 3 was kept for sub-sampling, and was not thin sectioned. The results of the ethno-geoarchaeological study of the floor sediments in two structures at Bhiliscleiter are presented below.

The ultimate composition of any archaeological floor deposits is determined by a complex set of interactions between a wide range of processes, including intentional and accidental anthropogenic impacts, which are idiosyncratic in nature and do not follow a set of known rules. With the passage of time a range of natural physical, chemical, and biological post-depositional processes, such as bioturbation, the decomposition of organic matter, and the diagenesis of anthropogenic materials also alter the composition of floor deposits (Courty *et al.*, 1989; Rolfsen, 1980; Schiffer, 1996). Since many different human-induced and natural processes can result in similar microfabrics and pedofeatures, a rigorous framework for analyzing the composition of floor deposits is essential to separate cultural and natural floor formation processes, and to investigate the nature and duration of activities that had originally taken place at shieling sites.

Numerous ethnoarchaeological and experimental studies of floor formation processes address the problem of equifinality (e.g. Boivin, 2000; Fitzpatrick, 1993; Macphail *et al.*, 2004, Milek, 2012), but no such research had been previously conducted at seasonally occupied pastoral settlements. Shielings would have been subjected to a unique set of cultural practices associated with their temporary occupation and pastoral function, which could have had an effect on the formation and preservation of the archaeological floor deposits at these sites. For example, according to historical and ethnographic sources on shieling structures in the Hebrides, it was

once common for a turf roof of a shieling hut to be repaired or re-erected on an annual basis usually shortly before the start of a shieling season (Campbell, 1896; Mackenzie, 1904). This could have involved either maintenance work on the roof, which would have disintegrated substantially during the cold season in the unheated shieling hut, or occasionally erecting a new roof. If similar practices were used in earlier centuries, the periodically roofless shieling structures could have acted as windblown sediment traps, which would have significantly altered the composition of their floor deposits, resulting in accumulation of aeolian sand during the periods of seasonal disuse. Temporary abandonment could have also resulted in weathering and partial disintegration of organic structural elements, such as turf walls and wooden roof supports, with organic material contained within them accumulating on the floors. Moreover, features that are considered characteristic for trampled occupation surfaces, such as increased compaction, a platy microstructure with characteristic horizontal cracks (planar voids), and the horizontal orientation of occupation debris such as bone, ash, plant tissues, small artefacts etc. (Davidson *et al.*, 1992), might be less pronounced in floor deposits of seasonally occupied structures, where trampling would have been significantly less than in permanently occupied structures.

Results

The micromorphological description will begin with a general overview of the main characteristics of the deposits captured in thin section, while more detailed descriptions of the separate samples, and tables summarizing the most important micromorphological characteristics, are presented in the following sections. The basic mineral composition of the occupation deposits captured in thin sections from the Bhiliscleiter shielings settlement was dominated by very fine-coarse sand (63- 2000 μm in size). The fine fraction (<50 μm) was mainly composed of amorphous organic matter; that is, organic matter that had decomposed to such an extent that it no longer had any visible cell structures and could not be identified optically. Two deposits (layers 4.1 and 4.4) were dominated by clay. The layers that were interpreted as occupation deposits tended to be associated with very fine-fine sand grains (63- 100 μm in size), which most likely represent the dominant grain size of the underlying substrate. Due to reworking by soil fauna some layers appeared to be composed of two or more distinctive fabrics. In these mixed, heterogeneous deposits fine sand grains dominated more compact and organic matter rich areas, which may be indicative of disturbed floor deposits. The fine sands in the floors at Bhiliscleiter could have made their way into the buildings

through a number of routes, including the trampling and reworking of the substrate underlying the floors, trampling soil in from outside the buildings, and the gradual disaggregation of the turves in the roof.

Some deposits captured in thin section had compositions dominated by larger-sized, medium-coarse sands (250-1000 μm), with few anthropogenic inclusions. Two possible explanations for the formation of these deposits were considered: 1) intentional spreading of sand on the floors as a maintenance practice to keep them level and clean, and 2) wind deposition during the periods of the structures' disuse/abandonment. The practice of spreading sand on the earthen floors was reported in some nineteenth- and early twentieth-century travel accounts from the Outer Hebrides (e.g. Gordon, 1937), and it was suggested for archaeological sites such as the Iron Age wheelhouse at Cnip, on Lewis, and the wheelhouse at Sollas, on South Uist (Armit, 1996:144-146). The ethnographic accounts, however, suggest that the intentional spreading of ash or dry powdered peat was more common than clean sand alone (see Kissling, 1943:86 and Mackenzie, 1905:402 for floor maintenance practices in the Outer Hebrides, and Milek, 2012:134-135 for practices in Iceland). Furthermore, these floor maintenance practices were reported for permanently occupied farms, and not for shieling settlements. Mary Campbell also does not mention the practice of spreading sand on the floors in her interview, and instead she states that 'the floor was earth, compressed, ... and some clay' (Campbell in Macdonald, 2012:79). Her recollection was corroborated by microscopic analysis of thin sections from Structure 10, which captured a distinctive clay floor. A natural windblown accumulation of medium-coarse sand is therefore a more plausible explanation for the formation of these deposits. The transport and deposition of coarser sand particles would require high wind velocity and/or a close sand source, as material coarser than 500 μm in diameter is normally transported over the ground surface by saltation and creep. Mean monthly wind speeds on the Isle of Lewis in December/January are about 16 knots (18 mph), though daily mean wind speeds over 30 knots (35 mph) with gusts in excess of 50 knots (58 mph) are not uncommon. The highest gust recorded at Stornoway in recent years was 98 knots (113 mph) in February 1962 (Comhairle nan Eilean Siar Contaminated Land Inspection Strategy). The Bhiliscleiter shielings settlement was exposed to the elements, and close to a sandy beach, which would have made these medium and coarse sand accumulations possible.

These deposits could be classified as 'loamy sands'; that is, deposits composed of 70%-85% sand grains. Due to the high degree of bioturbation their dominant microstructure (the size,

shape and arrangement of grains, aggregates and voids) was a channel microstructure, in which earthworm channels were the most frequent type of void. An intergrain microaggregate microstructure, in which the solid components of the sediments are a mixture of single grain particles such as sand grains and small aggregates of amorphous organic matter, was also present in these sand deposits, but it was never recorded for floor deposits (described below). Since all sand layers were embedded in a fine compact matrix of amorphous organic matter, the distribution of individual particles in relation to finer material (the coarse/fine related distribution) was such that the finer material filled all the spaces between the coarser constituents, a so-called porphyric or embedded coarse/fine related distribution. There was also a localized enaulic coarse/fine related distribution, in which small aggregates of fine material (in this case mostly amorphous organic matter and soil fauna excrements) were present in the interstitial spaces between sand grains. These sand layers were captured between floor deposits, and they may be indicative of periods when the site was temporarily abandoned, and windblown sand could accumulate on their floors. Some of these deposits contained higher quantities of amorphous organic matter, which might be associated with the weathering of the turf-built structural elements in the unheated buildings during abandonment phases.

Since all deposits captured in thin section were subjected to reworking by soil fauna, which resulted in relatively high quantities of granular soil fauna excrement in the form of minute aggregates of fine material, and numerous channels and vughs (irregularly shaped voids), floor layers could not be recognized only on the basis of the characteristics considered typical for trampled floors: increased compaction, a dominant platy microstructure, the presence of horizontal planar voids, and/or the horizontal orientation of occupation debris (Courty *et al.*, 1984; Davidson *et al.*, 1992). The high organic matter content noted in these occupation surfaces made them highly palatable to soil fauna, which probably encouraged post-depositional bioturbation. While pockets of the original fabric showed the characteristic horizontal orientation of components, in most areas the original organization of the sediment had been significantly altered. In the case of heavily bioturbated sediments like these, it would be difficult to distinguish horizontal bedding in the field, and high resolution techniques, such as micromorphological analysis, might be the only way to identify the original organization and composition of the deposits. Only two floor layers captured in thin sections from Structure 10 at Bhiliscleiter, layers 4.8 and 5.13, preserved a localized platy microstructure, with horizontal planar voids indicative of downward compaction by trampling. The occupation surfaces were therefore recognized on the basis of increased quantities of amorphous organic

matter and plant and wood tissues, and inclusions of charred organic remains. Increased quantities of wood and plant tissues may be interpreted as waste products from food processing and consumption, fuel storage, weathering of the turf and wood built roof, animal fodder, craft activities, or the wide variety of plant- and wood-made artefacts and furnishings, while charred organics may be indicative of accidental or intentional spreading of hearth waste on the floors.

Layers 4.2, 4.8, 4.10, and 5.11 also captured small fragments of pottery, including an unfired nodule of clay with fine sand temper, which suggests that small-scale ceramics manufacture could have taken place at Bhiliscleiter. According to Mary Campbell there was a source of clay near the site (Campbell in Macdonald, 2012:79). Interestingly, according to oral tradition, Hebridean crogan pots cradled in moss were used to carry milk back from the shielings to the townships (Cheape, 1992-1993, 2010). Crogan manufacture was carried almost exclusively by women who historically were also the keepers of shielings. The pots were glazed with milk and fired on the hearth, which would have made it possible to produce these during the annual stay at the shieling. Sample 6 also captured a fine layer composed of amorphous organic matter, fragmented grass phytoliths and grass pollen, and phosphatic nodules, which could be interpreted as a deposit of herbivore dung. TP1, from which this sample was taken, was located in the central part of Structure 10, and away from the bed platform, so it might have been an area where cows were kept overnight, as pointed out by Mary Campbell.

In less bioturbated areas the components in floor deposits were horizontally/sub-horizontally oriented, which suggests that they accumulated on a gradually accruing occupation surface. In contrast to the windblown sand deposits they had a low degree of sorting of their components. The thickness of floor deposits varied from 3 mm to 25 mm, and their composition was dominated by sandy silt loams, and silt loams (with the quantity of sand varying between 10% and 40%). Finer sand grains were also more abundant in these deposits. Where floor layers were less affected by soil fauna reworking, they were compacted, and displayed a porphyric coarse/fine related distribution, which is often associated with trampled occupation surfaces (Davidson *et al.*, 1992).

Structure 10

Sample 1

Sample 1 was taken from context 004 exposed in TP1. Context 004 was described in the field as a very organic, dark reddish brown silt loam deposit, which contained small quantities of

charcoal flecks. It was interpreted as a floor surface that formed during the last occupation phase of Structure 10. During the microscopic analysis this final occupation phase could be sub-divided into three distinctive floor surfaces (Table 1).

The uppermost floor deposit, layer 4.1, was a thin and compact layer composed almost entirely of clay and fine- to medium-sized sand grains (Figure 6). The so-called birefringence fabric of this layer was different to that of other deposits captured in thin section at Bhiliscleiter. The birefringence fabric describes the interference colours of the fine material observed between crossed polarizers. While the majority of the deposits had an undifferentiated b-fabric, with no observable interference colours, this layer displayed a stipple-speckled b-fabric, with randomly oriented and isolated striations of clay. In contrast to some clay features studied on other archaeological sites, in which the clay created a mono-striated (single orientation) b-fabric (e.g. hearth constructions in Milek and French 2007), the orientation of the clay striations in the upper floor layer of Structure 10 suggests that clay was applied to the floor in a random fashion, without any dominant direction. The layer was very clean and it contained very few inclusions, with 2-5% amorphous organic matter, and trace quantities of minute fragments of charred organics. These were rounded, and since the sample was taken close to the wall they may relate to maintenance practices, such as sweeping, which can result in accumulations of fragmented and rounded inclusions by the wall. Mary Campbell does not mention any specific floor maintenance practices ('we hadn't any cleaning to do, just your bed'), but it is possible that older women performed these. The inclusions tended to cluster towards the surface of the clay floor, with some found deeper in the layer, suggesting downward movement by trampling. The presence of a clay floor in Structure 10 confirms that pride was taken in maintaining an aesthetically pleasing shieling structure, and it corroborates well with the photographic record, which attests to well-maintained internal spaces at the Bhiliscleiter shieling settlement.

The underlying layer, 4.2, was composed of 40-50% amorphous organic matter, 10-20% plant tissues, 10-20% wood tissues, 2-5% charred peat, 2-5% charred amorphous organic matter, and trace quantities of charcoal, charred plant, and grass phytoliths (Table 1). Mary Campbell mentions a range of plant and wood furnishings used at Bhiliscleiter, such as heather bedding, a wooden bedstead, turf 'cushions' for side benches, and driftwood for shelves and for the roof construction: 'they had to have driftwood, as much as they could afford, to stop the turf from falling in'. The layer also contained trace quantities of fungal sclerotia, which are typical for topsoils, and are also frequently found in areas with increased organic matter content

(FitzPatrick, 1993:221). It could have derived from the roof turves, or it could be associated with high quantities of organic inclusions captured in the layer.

Charred organic remains, which originated in a hearth, may have been spread across the occupation surface by trampling, or swept across the floor. The deposit also captured a poorly fired clay fragment, with a fine- to medium-sized sand temper (Figure 6). It had a sharp boundary typical of fired ceramics, but it did not display isotropism, which is characteristic for ceramics fired at a temperature of 800-850°C for sustained periods of time. Localized darkened rims around the pore spaces instead suggest a firing temperature of around 500°C or less (Gregor, 2014), which is consistent with the temperature range of a domestic hearth. The chaotic structure of the matrix and temper suggests a hand-modeled vessel rather than a wheel-thrown one. The presence of low-temperature fired ceramic fragment in the hearth deposits may be indicative of small-scale pottery manufacture in Structure 10. This is supported by the presence of an unfired clay nodule with a similar sand temper.

Figure 6. Thin section 1, showing clay floor in layer 4.1; clay nodule with temper in layer 4.2; and zone of compaction in layer 4.3

The lowermost floor layer captured in sample 1, 4.3, was a fine layer of charred organic material in an amorphous organic matter matrix. The layer contained 10-20% charred peat, 5-10% charcoal, 2-5% charred amorphous organic matter, and trace quantities of charred plant tissues, which attest to a variety of fuel sources utilized by the inhabitants of this shieling hut. The deposit also captured 2-5% plant tissues, and 5-10% wood tissues, some of which contained phlobaphene (a reddish coloured phenolic substance), and probably represent wood bark. This layer can be interpreted as intentional or accidental spreading of the hearth waste on the floor. No calcareous ash accumulations were preserved in the layer, but they could have been leached down the profile with percolating rainwater.

Sample 1 did not capture an abandonment phase between layers 4.2 and 4.3, and they most likely belong to the same occupation phase. Layer 4.1 may represent a separate occupation phase, during which a clay floor was constructed in Structure 10. Fine-medium sand grains captured in this layer might derive from the clay source, as it is unlikely that clay would have been processed extensively prior to applying it to the floor. Mitchell notes in his 1880 description of crogan pottery manufacture by one Mrs. Macleod: ‘the clay she used underwent no careful or special preparation. She chose the best she could get, and picked out of it the

larger stones, leaving the sand and the finer gravel which it contained'. It is likely that a similar low degree of processing would be applied to clay used to construct a floor of a seasonally occupied dwelling. It is also possible that the medium-sized sand grains represent a fine windblown layer, which had originally been deposited between the two occupation phases, but which was re-mixed by bioturbation.

Sample 2

Sample 2 was taken to the east of sample 1, and it captured a sequence of occupation deposits associated with context 004. Layers 4.4-4-6 corresponded well with layers 4.1-4.3, which were captured in sample 1, and they can be interpreted as representing the same phase of occupation, with no pronounced differences in the composition of floor deposits, which would point to distinctive activity areas in Structure 10 (see Table 1).

The lowermost deposit captured in sample 2, layer 4.7, was significantly enriched in amorphous organic matter (40-50%), and it contained 5-10% wood tissues, 2-5% fungal sclerotia, and trace quantities of plant tissues and grass phytoliths. The layer also captured accumulations of charred peat and charcoal, but all of these inclusions were more fragmented than the charred organic matter captured in the layer above. Layer 4.7 also contained one fragment of uncharred peat, which may be indicative of fuel storage inside the structure. This deposit can be interpreted as a disturbed floor layer, which is likely to have formed during the same occupation phase as the overlying deposits.

Figure 7. Thin section 2, showing charred peat in layer 4.6; charred peat impregnated with iron in later 4.4; and horizontally bedded plant tissues in layer 4.7

Sample 6

Sample 6 was taken from the NE section of TP1, close to the wall of Structure 10. It captured a sequence of occupation surfaces alternating with sand deposits, and mixed deposits composed of at least two distinctive fabrics. These deposits corresponded with the two contexts described in the field: context 004, and context 005 (Table 1). Context 005 was described in the field as a very dark brown, compact, organic silt loam deposit. It was sandier than context 004, and it also appeared to contain smaller quantities of charcoal flecks. It was provisionally interpreted as an occupation surface mixed with a deposit of windblown sand indicative of a short abandonment phase. The deposits captured in sample 6 could be subdivided into distinctive

sub-phases: layers 4.8, 4.10 and 5.15 (mixed deposits), layers 4.9, 4.12, 5.9, 5.11, and 5.13 (occupation surfaces), and layers 4.11, 5.8, 5.10, 5.12, and 5.14 (sand accumulations).

The uppermost layer captured in this sequence, layer 4.8, was a disturbed sandy silt loam deposit, which appeared to be composed of two distinctive fabrics. The dominant fabric was associated with very fine-fine sand grains, and it was enriched in amorphous organic matter (40-50%). It also contained inclusions of 10-20% charred peat, 10-20% charcoal, 2-5% charred amorphous organic matter, 2-5% wood tissues, and trace quantities of phytoliths, diatoms, and plant tissues. The quantities of charred organic remains increased towards the top of the layer, and in places they were horizontally bedded, perhaps hinting at a very disturbed lensing. It appears likely that this lens formed when hearth waste was spread onto the floor. 2-5% rubified ferrous nodules and trace quantities of diatoms may be residues of this peat ash deposit. This fabric also captured a fragment of low-fired ceramic (Figure 8). The chaotic character of its matrix and temper suggests a hand-modelled vessel, perhaps of crogan tradition. This organic-rich fabric was associated with a range of anthropogenic inclusions, and it preserved zones of compaction with localized planar voids. Based on these characteristics it can be interpreted as a disturbed floor surface. The second fabric was composed of medium-coarse sand grains, which accumulated towards the bottom of the layer. This accumulation of well-sorted sand grains might be indicative of a lens of aeolian sand deposited during a short abandonment phase.

The lower mixed deposit was also classified as a sandy silt loam, and its composition was similar to layer 4.8. The dominant fabric of layer 4.10 was also enriched with 40-50% amorphous organic matter, and it captured significant quantities of charred organics, including 20-30% charred peat and 5-10% charcoal. The layer also contained trace quantities of plant tissues, phytoliths, diatoms, ferrous nodules, and phosphatic nodules. High quantities of charred peat towards the top of the layer suggest the presence of a disturbed lens composed of hearth waste material. A fragment of a low-fired ceramic was captured in an earthworm channel cutting through this layer, and it is likely that it was translocated from it. Despite reworking by soil fauna, which resulted in a dominant channel microstructure, the layer preserved zones of compaction, and its overall porosity was relatively low at 20-30%. The second fabric was associated with accumulations of medium-coarse sand with few inclusions. The two fabrics can be interpreted as indicative of a disturbed occupation surface mixed with a lens (or lenses) of windblown sand, possibly related to a short abandonment phase.

Sample 6 captured two other occupation surfaces, which alternated with mixed deposits and sand layers. Layer 4.9 was a fine deposit composed of a dense matrix of amorphous organic matter (50-60%), with inclusions of 5-10% fragmented phytoliths, 2-5% wood tissues, and trace quantities of diatoms and plant tissues (Figure 8). The layer also contained 5-10% phosphatic nodules. Its composition is indicative of a deposit composed almost entirely of herbivore dung. Its degree of compaction, low porosity (10-20%), and a localized massive microstructure suggest compaction by trampling. TP1 was opened in the central part of Structure 10, and it appears that in this phase of occupation it was the location of the boundary between the part of the building used to house livestock and the main residential space. The deposit also captured inclusions of fragmented charred organic remains embedded in this compacted organic matrix at random angles, which suggest that they could have been trampled into the layer, probably by the inhabitants moving between different parts of the structure. This 3 mm thick layer of herbivore dung may relate to a short episode when cattle were kept in the central space, and the layer had no equivalents in other samples taken from Structure 10. One might speculate that sample 6 captured a slight change in the use of the internal space in Structure 10, which involved the byre end encroaching on the central part of the structure.

Figure 8. Thin section 6, showing pottery fragment in layer 4.8; dense matrix of amorphous organic matter in layer 4.9; and charred peat in layer 4.12

The final occupation surface captured in sample 6, layer 4.12, was composed of 40-50% amorphous organic matter, with significant quantities of charred organics: 10-20% charred peat, 2-5% charred amorphous organics, and trace amounts of charred plant and charcoal. Most components were horizontally oriented, which suggest that they accumulated on a gradually accruing surface; however, the layer also experienced some disturbance by soil fauna, with the largest fragment of charred peat vertically oriented due to bioturbation.

Layer 4.11, which separated the final occupation surface, 4.12, from mixed deposit 4.10, was a very fine lens of moderately sorted medium-coarse sand. It contained 10-20% amorphous organic matter, 2-5% minute fragments of charred amorphous organics, and trace quantities of fragmented charred peat and phytoliths. This layer may be indicative of a short abandonment phase, but its poor sorting, and the presence of relatively high quantities of amorphous organic matter, charred organic matter, and other organic inclusions, suggest that it might have formed as a result of the weathering of structural turves in the unheated shieling structure, with possible additions of aeolian sand.

Context 005 was also captured in this thin section as a sequence of sand layers alternating with occupation deposits, but it was less disturbed than context 004, and it contained only one mixed layer composed of more than one fabric. The uppermost layer in this sequence, 5.8, was a fine lens of moderately sorted medium-coarse sand. It contained 20-30% amorphous organic matter, 2-5% charred peat, 2-5% charred amorphous organic matter, and trace quantities of charcoal, plant tissues, and phytoliths. Charred organic remains captured in the layer were very fragmented, and minute in size. The sandy loam deposit was quite compact with an overall porosity of 10-20%, and it appeared embedded in a fine organic matrix, which suggests that it was subjected to post-depositional trampling. This sand deposit may be indicative of a short abandonment phase, with inclusions derived from the weathering of structural turves.

Sample 6 captured three more sand deposits, layers 5.10, 5.12, and 5.14, which were similar in composition to layer 5.8, but contained lower quantities of amorphous organic matter. These sand lenses were thin (with the maximum thickness of 4-7 mm), and only partially preserved. They were composed of 70% moderately sorted medium-coarse sand, and 10-20% amorphous organic matter. The lowermost lens, layer 5.14, also contained small quantities of very fine gravel. In all three deposits the sands that dominated the layers were embedded in a fine organic matrix, and displayed a localized single-spaced porphyric coarse/fine related distribution, which suggests that they might have been subjected to trampling. All lenses contained up to 2-5% very fragmented charred amorphous organic matter and charred peat, and trace quantities of plant tissues and phytoliths. Layers 5.10, 5.12, and 5.14 can be interpreted as abandonment phases between three distinctive occupation phases. These deposits were composed of windblown medium-coarse sand grains, mixed with the material associated with the weathering of the turf-built walls and roof (organic matter, sand grains of different sizes, plant tissues, and phytoliths). The minute charred organics might be also windblown in origin, or they could be associated with soot weathered from the ceiling and walls.

Between these sand accumulations sample 6 captured three distinctive occupation surfaces, layers 5.9, 5.11, and 5.13. These varied in thickness from 5-8 mm, and were classified as sandy silt loam deposits, with the coarse fraction dominated by fine-medium sand grains. They contained higher quantities of sand grains than occupation deposits associated with context 004, an observation also made in the field due to the 'sandier' feel of this layer during hand texturing. All three deposits were very similar in composition, and they contained 40-50% amorphous organic matter, up to 2-5% plant tissues, and trace quantities of phytoliths. The

quantities of charred organic matter varied slightly between the layers, with 10-20% charred peat, 2-5% charcoal, 2-5% charred amorphous, and trace quantities of charred plant tissues in 5.9, 5-10% charred peat, 5-10% charcoal, 2-5% charred amorphous organic matter, and trace quantities of charred plant tissues in 5.11, and 10-20%, 2-5% charcoal, and 2-5% charred amorphous organic matter in 5.13. Peat appeared to be the main source of fuel during all of these occupation phases, supplemented by low quantities of wood. Layer 5.11 and 5.13 also captured small fragments of pottery, with the appearance typical of low-temperature fired ceramics (non-isotropic between crossed polarizers, with some charring around pore spaces). These two ceramic fragments also displayed a poorly oriented matrix and temper ranging from very fine-medium sand, which, together with a firing temperature range of a domestic hearth, suggest that they represent handmade vessels. The bioturbation of all three layers resulted in dominant channel and vughy microstructures, and a porosity of 20-30%. However, all deposits also contained localized zones of compaction in which there was a dominant single-spaced porphyric coarse/fine related distribution. Layer 5.13 also captured localized planar voids, which suggest downward compaction by trampling. In some places the horizontal orientation of components was preserved, but generally they were randomly oriented due to reworking by soil fauna. Layers 5.9, 5.11, and 5.13 can be interpreted as relatively short-lived occupation deposits. Their relatively uniform composition suggests that there was no major change in internal organization of activities (at least in the central space) during these three occupation phases, which might relate to three shieling seasons.

The final deposit captured in this thin section was a very disturbed layer, which appeared to be mixed with the overlying sand lens 5.14. When areas dominated by medium-coarse sand grains were excluded from the visual estimates, the main fabric was similar to other floor deposits captured as a part of this context. Layer 5.15 was composed of 40-50% amorphous organic matter, and it contained inclusions of 10-20% charred peat, 2-5% charcoal, 2-5% charred amorphous organic matter, and 2-5% wood tissues. Horizontal orientation of components was preserved in zones of compaction, which also displayed a single-spaced porphyric coarse/fine related distribution. However, outside of these compacted areas, the layer was affected by intensive bioturbation, which resulted in the random orientation of inclusions, a porosity of 30-40%, and channel and vughy microstructures. Layer 5.15 can be interpreted as a disturbed occupation surface, locally mixed with material from windblown sand lenses.

Structure 11

Sample 4

Sample 4 captured context 008, which was described in the field as a very humic deposit, which formed on top of a cobbled surface. Its texture and composition suggested a very high organic content, and it was noted that the layer was very similar in appearance to dung-rich layers typical of animal byres. The cobbled surface in this assessment trench was very thick, and consisted of at least two distinctive layers. A cobbled surface is often, though not exclusively, associated with buildings that housed animals, as it improves drainage and makes it easier to remove animal waste.

To an extent this preliminary interpretation was corroborated by thin section analysis. Sample 4 captured a thick deposit, which was dominated by amorphous organic matter at 50-60%. It also captured 5-10% plant tissues, 5-10% wood tissues, and 2-5% grass phytoliths (Figure 9). The quantities of the latter are probably underestimated as in places they appeared obscured by the dense organic matrix, and were therefore difficult to identify. The layer also contained 2-5% fungal sclerotia, which are commonly found in organic soils. The deposit also captured very fragmented charred organic remains, including 2-5% charred peat, and 2-5% charred amorphous organic matter. These were randomly oriented and minute in size, and could have been wind-deposited. Layer 8.1 can be interpreted as a turf-collapse layer, most likely representing the collapse of the turf roof. This corroborates well with Mary Campbell's account, which noted that roofs were not seasonally removed at the Bhiliscleiter shieling settlement during the last years of its use. Elongated grass phytoliths, plant tissues and amorphous organic matter are indicative of the decomposed grassy component of turf, while fungal sclerotia and the sandy component of layer 8.1 are most likely derived from the soil held by grass roots. Trace quantities of woody tissues captured in the layer may be the remains of wooden structural elements that collapsed with the roof. The layer also contained small amounts of charred organic matter, which could be indicative of soot accumulation in the roof turf. This collapse deposit accumulated directly on the cobbled surface, and there was no evidence for floor layers below it. It is possible that these were removed during the last season of occupation, which would support the interpretation of this part of Structure 11 as an animal shelter, with dung deposits frequently cleaned out of the cobbled floor.

Figure 9. Thin section 4, showing grass phytoliths in dense amorphous organic matter matrix; plant tissues; and wood tissues

Discussion

The sequences of ephemeral occupation surfaces alternating with thin windblown deposits, which were identified in thin sections 1, 2, 4, and 6, could not be identified in the field with the naked eye; however, slight differences in textures were recognized during excavation, and fine lensing was suspected. It would not be possible to identify these layers without the aid of high-resolution microscopic analysis. While the occupation deposits could be recognized on the basis of high quantities of anthropogenic inclusions, horizontal bedding of these components, and increased compaction, they were very ephemeral, especially in comparison to floor sediments studied micromorphologically at permanently occupied settlements (e.g. Milek, 2005; Milek, 2012). They also lacked well-developed platy microstructures and planar voids, which reflects the temporary nature of occupation of the structures, with less intensive foot traffic within them. Micromorphological analysis was also essential for the identification of microscopic residues that could not be identified in the field, such as plant and wood tissues, dung, residues of ash, and, in some cases, minute fragments of artefacts. These residues relate to a wide range of activities, maintenance practices, and internal furnishings in the two studied structures, and they corroborate well with the descriptions of these provided by Mary Campbell. The microscopic study attests to the presence of livestock in the residential structures, the sources of fuel utilized by the inhabitants of the site, which included both wood and peat, and small-scale craft activities, such as domestic pottery production. It also provided additional information about possible maintenance practices, such as the sweeping of floors and constructing clay floors. Micromorphological analysis also enabled the identification of aeolian sand deposits, which were recognized on the basis of their high degree of sorting and low quantities of inclusions. These uncompacted and ‘clean’ deposits are likely to have accumulated during periods when the structures were seasonally abandoned.

The formation of the clean sandy deposits associated with seasonal abandonment phases would have been affected by site maintenance practices. The practice of the seasonal removal of the roofs reported for the Hebridean shielings could have contributed to a more pronounced accumulation of aeolian sand during periods of disuse, which might be characteristic of shieling settlements that were maintained in this way. The layers of aeolian sand at Bhiliscleiter were quite ephemeral, which might be related to the abandonment of this maintenance practice in the last phases of the site’s use. Temporary abandonment could also result in weathering, a more pronounced disintegration, and sometimes even a partial collapse of structural elements such as turf walls and wooden roof supports, which were reported as the dominant building materials for Scottish shielings. The organic matter within these building materials could

accumulate on the floors of disused structures, a process that is likely to explain the composition of some of the abandonment deposits identified at Bhiliscleiter.

One of the main goals of this study was to improve techniques for the identification of punctuated occupation at suspected shieling settlements, and to gain a better understanding of activities associated with summer transhumance. The analytical framework developed for this study enabled the identification of shifts in the type and the duration of occupation at the Bhiliscleiter shieling settlement; however, a more systematic geoarchaeological sampling strategy, which was beyond the scope of this study, could potentially allow for an even better understanding of the spatial organization of activities within the shieling structures, and could enable the identification of activity areas outside of them, where many day-to-day tasks are likely to have taken place during the summer months. This analytical framework has been successfully applied to the identification of punctuated occupation at two putative shielings in the Outer Hebrides with origins in the early medieval period: Morsgail on the Isle of Lewis, and Kildonan on South Uist (Kupiec and Milek, forthcoming).

The ethno-geoarchaeological study at Bhiliscleiter proved invaluable on several fronts. The stratigraphic sequence captured in thin section attests to the punctuated nature of occupation at the site, and it demonstrates that micromorphological analysis of floor sediments can be applied to detect periods of punctuated occupation and abandonment at other putative shieling sites. The study also broadens our understanding of the range of possible floor formation processes, including every-day activities and maintenance practices, which could have been taking place at seasonally occupied pastoral settlements in both the recent and the more distant past. While it is not possible to draw a direct analogy between cultural practices at this twentieth-century shieling site and shielings used in the distant past, this ethno-geoarchaeological research extends the repertoire of possible interpretations, and it demonstrates the potential of micromorphological analysis to detect seasonal occupation and the activities associated with it.

Table 1. Summary of features observed in thin sections 1-2, 4, and 5-6 at Bhiliscleiter shieling settlement

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